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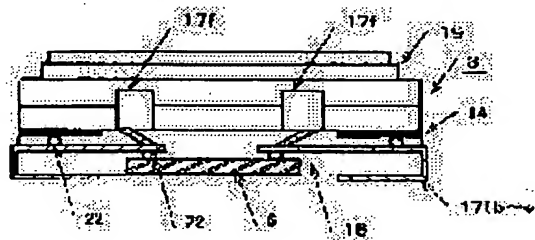
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## (54) TEMPERATURE COMPENSATING CRYSTAL OSCILLATOR FOR SURFACE MOUNTING

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a reliable temperature compensating crystal oscillator for surface mounting that is specially suitable for reduced height, and has improved productivity.

**SOLUTION:** In the temperature compensating crystal oscillator for surface mounting, a flat terminal plate having a plurality of lead terminals is provided, IC chips are arranged at the other-surface side of the flat terminal plate for directly connecting each lead terminal to a plurality of terminal electrodes of the IC chip, a crystal oscillator is arranged at the one surface side of the flat terminal plate, at the same time, the lead terminal connected to the crystal terminal electrode of the IC chip is directly connected to the mounting electrode of the crystal oscillator for resin-molding the IC chips, the lead terminal connected to the power supply, output, and terminal electrode for grounding of the IC chips is used as a mounting terminal for surface mounting for bending from the side of the resin molding to the bottom surface, and the lead terminal connected to the temperature compensating mechanism of the IC chip for writing compensation data is bent to the side of the crystal oscillator.



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**CLAIMS**

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**[Claim(s)]**

[Claim 1] A quartz resonator which carries out sealing enclosure of the Xtal piece, and has a mounting electrode of a pair on a base. An oscillator circuit and a temperature-compensation device except said quartz resonator are the temperature compensated crystal oscillator equipped with the above, and it has a plate-like terminal assembly which has two or more lead terminals. On the other hand, arrange said IC chip to a side and said each lead terminal and two or more terminal electrodes of said IC chip are directly connected to it. said plate-like terminal assembly -- Connect directly a mounting electrode of said lead terminal connected to the Xtal terminal electrode of said IC chip while having arranged said quartz resonator to a whole surface side of said plate-like terminal assembly, and said quartz resonator, and the resin mold of said IC chip is carried out. Said lead terminal linked to a terminal electrode for a power supply of said IC chip, an output, and a ground is bent on a base from the side of said resin mold as a mounting terminal for surface mounts. It is characterized by bending said lead terminal which connects with said temperature-compensation device and writes in compensation data on the side of said quartz resonator.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]**

[0001]

[The technical field to which invention belongs] This invention makes the temperature compensated crystal oscillator for surface mounts (it considers as a temperature-compensation oscillator) the technical field on industry, and relates to the temperature-compensation oscillator which promoted especially the miniaturization.

[0002] (Background of invention) To a temperature change, since oscillation frequency is stability, a temperature-compensation oscillator is used for the cellular phone used under a dynamic environment. In recent years, small intensifies and low back-ization is called for with the plane appearance.

[0003] (An example of the conventional technology) Drawing 4 is a schematic diagram of the temperature-compensation oscillator explaining the 1 conventional example. A temperature-compensation oscillator consists of a ridge oscillator 1 and a temperature-compensation device 2. A ridge oscillator 1 consists of a quartz resonator 3 and an oscillator circuit 4. The temperature-compensation device 2 is impressed to the voltage variable-capacity element 5 which inserted the compensation voltage from the compensation voltage-generating circuit which is not illustrated into the closed loop of a ridge oscillator 1. With the compensation data based on the frequency temperature characteristic of a ridge oscillator 1, a compensation voltage-generating circuit-generates compensation voltage. The IC chip 6 and quartz resonator 3 which were shown by the dotted line frame which integrated the oscillator circuit 4 and the temperature-compensation device 2 are unified, and it consists of such things.

[0004] As the 1st concrete example (two-room type), as shown in drawing 5, the Xtal piece 8 is held to one crevice of the main part 7 of a container which consists of a laminating ceramic which made the cross-section configuration the shape of H character, for example, by seam welding, covering 9 is put and sealing enclosure is carried out. And the circuit element which includes the IC chip 6 at least is held in the crevice of another side, and a filler (un-illustrating) is laid underground. In the side wall and end face of a crevice of another side, it has the mounting terminal 10 for surface mounts. Moreover, the write-in terminal 11 of compensation data is formed in the side of the main part 7 of a container. the electroconductive glue which the sign 12 in drawing connects the Xtal piece 8 electrically and mechanically, and is held -- said -- 19 is a metal ring for seam welding.

[0005] As the 2nd example (cementation type), it considers, for example as the configuration which joined the mounting container 13 which held IC-chip to the rear face of the quartz resonator 3 which carried out

sealing enclosure of the Xtal piece 8 into the main part of a container which consists of the existing quartz resonator 3, i.e., laminating ceramic, (drawing 6). However, in the side of the mounting container 13, it has the write-in terminal 11, and has the mounting terminal 10 in an end face and the side. the sign 14 in drawing -- the mounting electrode of a quartz resonator 3 -- said -- 15 is the cementation electrode of the mounting container 13.

[0006] It considers as the configuration which fixed the IC chip 6 on the crevice base of the main part 16 of a container, fixed the Xtal piece 8 to the step of a crevice, and carried out sealing enclosure as the 3rd example (part store type) (drawing 7). However, in the side of the main part 16 of a container, it has the write-in terminal 11, and has the mounting terminal 10 in the side and a rear face.

[0007]

[Problem(s) to be Solved by the Invention] (Trouble of the conventional technology) However, in the temperature-compensation oscillator of the above-mentioned configuration, the next problem of a certain thing had each feature. That is, by the 1st-example two-room type (drawing 5), since the IC chip 6 was held after carrying out sealing enclosure of the Xtal piece 8 into seven within the main part of a container, the manufacturing process became series and there was a problem to which productivity falls. Moreover, since the main part 7 of a container is formed in the shape of H of baking, bending is produced in the horizontal level (central dashboard) made into the shape of H, and flatness is bad. When following, for example, fixing the IC chip 6 by the ultrasonic thermocompression bonding using a bump etc., there was a problem which wakes up an electric faulty connection.

[0008] Moreover, by the 2nd cementation type (drawing 6), since what is necessary is to manufacture the mounting container 13 in juxtaposition and just to join with a quartz resonator 3, productivity is raised. However, since the quartz resonator 3 and the mounting container 13 had the bottom wall, there was a problem which enlarges the part height size.

[0009] Furthermore, by the 3rd-example one-room type (drawing 7), although it was the easiest to realize low back-ization, since the Xtal piece 8 was held after fixing the IC chip 6, there was a problem which cannot perform strong excitation which removes the property and the very small foreign matter as quartz-resonator 3 simple substance. That is, there was a problem which lacks in reliability.

[0010] (The purpose of invention) Especially this invention aims at offering the temperature-compensation oscillator which fitted low back-ization and raised productivity and reliability.

[0011]

[Means for Solving the Problem] This invention is equipped with the plate-like terminal assembly 17 which has two or more lead terminals 17 (a-f). On the other hand, arrange the IC chip 6 to a side and each lead terminal 17 (a-f) and two or more terminal electrodes of the IC chip 6 are directly connected to it. the plate-like terminal assembly 17 -- Connect directly lead terminal 17a and the mounting electrode 14 of a quartz resonator 3 which were connected to the Xtal terminal electrode of the IC chip 6 while having arranged a quartz resonator 3 to a whole surface side of the plate-like terminal assembly 17, and the IC chip 6 is carried out resin mold 18. The lead terminal 17 (b-e) linked to a terminal electrode for a power supply of the IC chip 6, an output, and a ground is bent on a base from the side of the resin mold 18 as a mounting terminal for surface mounts. Let it be a solution means to have bent 17f of lead terminals which connect with a temperature-compensation device of the IC chip 6, and write in compensation data on the side of a quartz resonator 3 (refer to Figs. 1 - 3).

[0012]

[Function] In this invention, IC chip and the mounting terminal of a plate-like terminal assembly are connected separately from the manufacturing process of a quartz resonator, and it unites with a quartz resonator after that. Therefore, as compared with a two-room type (H structure), it considers as a juxtaposition manufacturing process. And as compared with a two-room type dashboard, flatness of a plate-like terminal assembly is made good. Moreover, as compared with a cementation type, since a plate-like terminal assembly is used, the bottom wall layer of a mounting container is made unnecessary. Furthermore, since the quartz resonator which carried out sealing enclosure of the Xtal piece is used as compared with an one-room type, it can treat independently. Hereafter, one example of this invention is explained.

[0013]

[Example] Figs. 1 thru/or 3 are drawings of the temperature-compensation oscillator explaining one example of this invention, and a bottom plan view and drawing 3 of the cross section where drawing 1 is typical, and drawing 2 are drawings of a plate-like terminal assembly. In addition, a jack per line is given to the same portion as the before conventional example Fig., and the explanation is simple -- or it omits. A temperature-compensation oscillator serves as the ridge oscillator 1 which consists of a quartz resonator 3 and an oscillator circuit 4 from the temperature-compensation device 2 in which compensation voltage is impressed to the voltage variable-capacity element 5 inserted into the oscillation closed loop. And it comes to integrate an oscillator circuit 4 and the temperature-compensation device 2 including the voltage variable-capacity element 5 except a quartz resonator 3 in the IC chip 6 (refer to front drawing 4).

[0014] A temperature-compensation oscillator is constituted from a quartz resonator 3, the IC chip 6, the plate-like terminal assembly 17, and the resin mold 18 by this example. A quartz resonator 3 carries out sealing enclosure of the Xtal piece 8 into the main part of a container as mentioned above, and has a mounting electrode on a base. The plate-like terminal assembly 17 becomes unable to put two or more lead terminals 17 (a-f) in order superficially. The end of each lead terminal is concentrated on a central field. Here, press working of sheet metal of the metal plate which consists of copper is carried out, and two or more lead terminals are connected with a frame 20. A sign 21 is the connection section and width of face is omitted.

[0015] In such a thing, each terminal electrode (un-illustrating) exposed to the tip of two or more lead terminals 17 (a-f) first concentrated on the central field of the plate-like terminal assembly 17 which has a frame 20, and the surface of the IC chip 6 is connected electrically and mechanically by the ultrasonic thermocompression bonding using a bump 22 (drawing 3). In addition, the dotted line in drawing is the bending section. Next, lead terminal 17a linked to the mounting electrode 14 of the pair of a quartz resonator 3 and the Xtal terminal electrode of the pair of the IC chip 6 electrically connected with a quartz resonator 3 is connected by the ultrasonic thermocompression bonding using the same bump 22 as the above-mentioned.

[0016] Next, metal mold is used for the perimeter of the IC chip 6 arranged on the base of a quartz resonator 3, resin is poured in, this is hardened, and it considers as the resin mold 18. And the lead terminal 17 (bcde) linked to the power supply of the IC chip 6, an output, a ground, and an AFC (automatic frequency control) electrode terminal is bent on the inferior surface of tongue of resin mold, and it considers as the mounting terminal for surface mounts. Furthermore, 17f of two or more lead terminals linked to the terminal electrode in which compensation data is written by the temperature-compensation device of the IC chip 6 is bent to the side-side of a quartz resonator 3, and let

them be write-in terminals.

[0017] With such a configuration, IC chip and the mounting terminal of a plate-like terminal assembly are connected separately from the manufacturing process of a quartz resonator, and it unites with a quartz resonator after that. Therefore, since the Xtal piece 8 made into the conventional example and the IC chip 6 are made into a juxtaposition manufacturing process as compared with the two-room type (H structure) held separately, productivity is improved. Moreover, since the plate-like terminal assembly 17 is used, flatness is made better than the dashboard of H structure. Therefore, electric connection by the bump 22 is ensured in this example. Since the existing quartz resonator which circulates actually in this example especially is used, it becomes economical.

[0018] Moreover, as compared with the cementation type which joined the mounting container 13 to the base of a quartz resonator 3, since the plate-like terminal assembly 17 is used, the mounting container 13 is made unnecessary. And since thickness of the plate-like terminal assembly 17 can be made small (about 100 micrometers or less) to the bottom wall layer (about 700 micrometers) of the mounting container 13, low back-ization as the whole is promoted.

[0019] Furthermore, as compared with the one-room type which holds the Xtal piece 8 and the IC chip 6 together, the quartz resonator 3 which carried out sealing enclosure of the Xtal piece 8 is used. Therefore, a quartz resonator can be treated independently and the electrical characteristics as a quartz resonator simple substance can be checked beforehand. And the foreign matter by strong excitation can be removed and the so-called cure against DLD (Drive Level dependency) can be performed. Therefore, reliability is raised.

[0020] Moreover, since the mounting terminal 17 (b-e) bent 17f of lead terminals used as a write-in terminal to the quartz resonator side of the reverse sense, electrical installation with the circuit pattern of the circuit board in which this is carried is certainly avoidable.

[0021]

[Other matters] What is necessary is to be able to apply, even when it has a mounting electrode, for example in four corners, and just to, change each lead terminal of the plate-like terminal assembly 17 into arbitration in short, although the quartz resonator 3 with which the mounting electrode 14 was formed in the both-ends side was used in this invention. Moreover, although 17f of lead terminals used as a write-in terminal was bent on the side of a quartz resonator 3, notching can be prepared, for example in the side of a quartz resonator 3, it can lay underground in a field, and a plane dimension can also be maintained.

[0022] moreover, although the resin mold only of the IC chip was arranged and carried out to the other principal plane side of the plate-like terminal assembly 17, the bypass capacitor of a during [ the power supply which is not a drawing example, for example, and a ground ] may be formed. In this case, what is necessary is just to add the lead terminal for these to the plate-like terminal assembly 17. Moreover, although 17f of lead terminals for write-in terminals was made into four pieces, it can fluctuate if needed, and they extend lead terminal 17a connected with the Xtal terminal electrode further, for example to a quartz resonator 3 side, and may enable it to measure the property of a quartz resonator simple substance for a temperature compensation oscillator after assembly.

[0023] Moreover, although each terminal electrode of the IC chip 6, a lead terminal 17 (a-f) and the mounting electrode 14, and lead terminal 17a considered as the ultrasonic thermocompression bonding or thermocompression bonding which used the bump, the connection using electroconductive glue etc. according to necessity is sufficient, and it is good if electrical installation is trustworthy in short.

[0024]

[Effect of the Invention] On the other hand, arrange IC chip to a side and each lead terminal and two or more terminal electrodes of IC chip are directly connected to it. the plate-like terminal assembly which has two or more lead terminals in this invention -- having -- a plate-like terminal assembly -- Connect directly the mounting electrode of a lead terminal and a quartz resonator connected to the Xtal terminal electrode of IC chip while having arranged the quartz resonator to the whole surface side of a plate-like terminal assembly, and the resin mold of the IC chip is carried out. The lead terminal linked to the terminal electrode for the power supply of IC chip, an output, and a ground was bent on the base from the side of resin mold as a mounting terminal for surface mounts, and the lead terminal which connects with the temperature-compensation device of IC chip, and writes in compensation data was bent on the side of a quartz resonator. Therefore, the temperature-compensation oscillator which fitted especially low back-ization and raised productivity and reliability can be offered.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the cross section of the temperature-compensation oscillator explaining one example of this invention.

[Drawing 2] It is the bottom plan view of the temperature-compensation oscillator explaining one example of this invention.

[Drawing 3] It is the plan of the plate-like terminal assembly explaining one example of this invention.

[Drawing 4] It is the block circuit diagram of the temperature-compensation oscillator explaining the conventional example.

[Drawing 5] It is the cross section of the temperature-compensation oscillator explaining the example [ 1st ] conventional example.

[Drawing 6] It is the cross section of the temperature-compensation oscillator explaining the example [ 2nd ] conventional example.

[Drawing 7] It is the cross section of the temperature-compensation oscillator explaining the example [ 3rd ] conventional example.

[Description of Notations]

1 Ridge Oscillator, 2 Temperature-Compensation Device, 3 Quartz Resonator, 4 Oscillator Circuit, 5 voltage variable-capacity element, 6 7 IC chip, 16 The main part of a container, 8 Xtal piece, 9 Covering, 10 A mounting terminal, 11 A write-in terminal, 12 Electroconductive glue, 13 A mounting container, 14 A mounting electrode, 15 A connection electrode, 17 A plate-like terminal assembly, 17 (a-f) A lead terminal, 18 Resin mold, 19 A metal ring, 20 A frame, 21 The connection section, 22 Bump

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HA10 HA16 HA25 HA27 HA28

HA29

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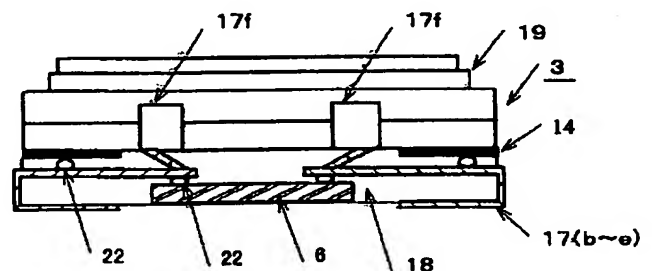
GG15 GG18 GG20 KK04

(54) 【発明の名称】 表面実装用の温度補償水晶発振器

(57) 【要約】

【目的】 特に低背化に適して生産性及び信頼性を高めた表面実装用の温度補償発振器を提供することを目的とする。

【構成】 複数のリード端子を有する平板状端子板を備え、平板状端子板の他面側に I Cチップを配置して各リード端子と I Cチップの複数の端子電極とを直接的に接続し、平板状端子板の一面側に水晶振動子を配置するとともに I Cチップの水晶端子電極に接続したリード端子と水晶振動子の実装電極とを直接的に接続して I Cチップを樹脂モールドし、 I Cチップの電源、出力及びアース用の端子電極に接続したリード端子を表面実装用の実装端子として樹脂モールドの側面から底面に折曲し、 I Cチップの温度補償機構と接続して補償データを書き込むリード端子を水晶振動子の側面に折曲した構成とする。



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には例えば水晶端子電極と接続するリード端子17aを水晶振動子3側に延出して、温度補償発振器を組立後に水晶振動子単体の特性を測定できるようにしてもよい。

【0023】また、ICチップ6の各端子電極とリード端子17(a～f)及び実装電極14とリード端子17aはバンプを用いた超音波熱圧着又は熱圧着としたが、必要に応じて導電性接着剤等を用いた接続でもよく要は電氣的接続が確実であればよい。

【0024】

【発明の効果】本発明は、複数のリード端子を有する平板状端子板を備え、平板状端子板の他面側にICチップを配置して各リード端子とICチップの複数の端子電極とを直接的に接続し、平板状端子板の一面側に水晶振動子を配置するとともにICチップの水晶端子電極に接続したリード端子と水晶振動子の実装電極とを直接的に接続してICチップを樹脂モールドし、ICチップの電源、出力及びアース用の端子電極に接続したリード端子を表面実装用の実装端子として樹脂モールドの側面から底面に折曲し、ICチップの温度補償機構と接続して補償データを書き込むリード端子を水晶振動子の側面に折曲したので、特に低背化に適して生産性及び信頼性を高めた温度補償発振器を提供できる。

【図面の簡単な説明】

(4)

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【図1】本発明の一実施例を説明する温度補償発振器の断面図である。

【図2】本発明の一実施例を説明する温度補償発振器の底面図である。

【図3】本発明の一実施例を説明する平板状端子板の平面図である。

【図4】従来例を説明する温度補償発振器のブロック回路図である。

【図5】従来例の第1例を説明する温度補償発振器の断面図である。

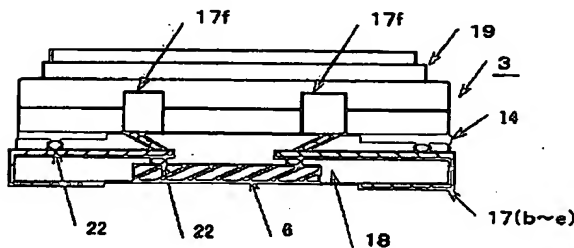
【図6】従来例の第2例を説明する温度補償発振器の断面図である。

【図7】従来例の第3例を説明する温度補償発振器の断面図である。

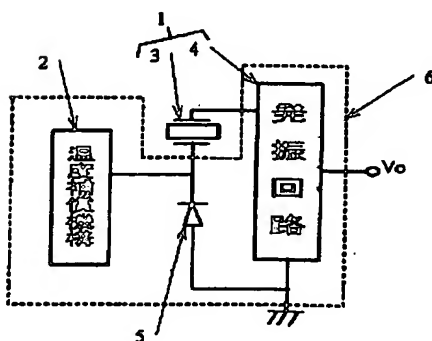
【符号の説明】

1 水晶発振回路、2 温度補償機構、3 水晶振動子、4 発振回路、5 電圧可変容量素子、6 ICチップ、7、16 容器本体、8 水晶片、9 カバー、10 実装端子、11 露出端子、12 導電性接着剤、13 実装容器、14 実装電極、15 接続電極、17 平板状端子板、17(a～f) リード端子、18 樹脂モールド、19 金属リング、20 フレーム、21 連結部、22 バンプ

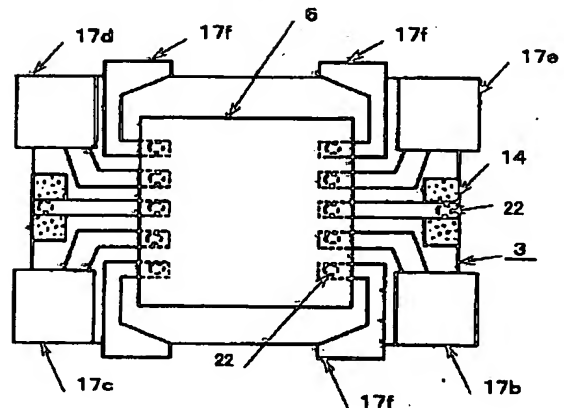
【図1】



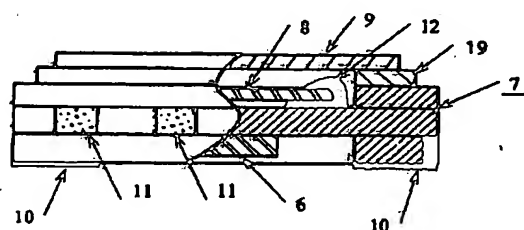
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【図2】

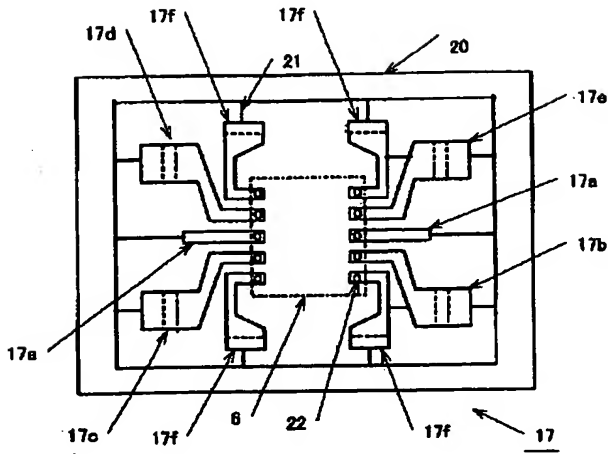


【図5】

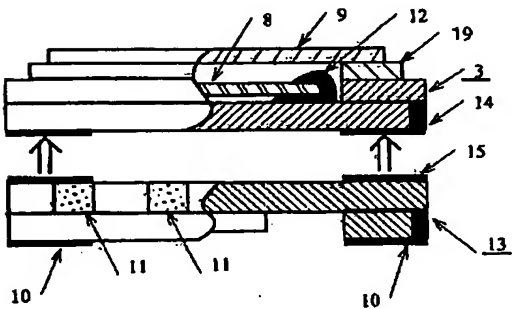


(5)

【図3】



【図6】



【図7】

